UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Southwest Region
501 West Ocean Boulevard, Suite 4200
Long Beach, California 90802- 4213

In response refer to:
151422SWR2001SA5686:HLB

JUL 28 2005

Michael J. Ryan
Area Manager
United States Bureau of Reclamation
2800 Cottage Way
Sacramento, California 95825

Dear Mr. Ryan:

This document transmits NOAA's National Marine Fisheries Service's (NMFS) final biological and conference opinion (Enclosure) based on our review of the proposed Feather River Water District (FWD) Long-term Central Valley Project (CVP) Water Service Contract Renewal, in Sutter County, California, and its effects on federally-listed endangered Sacramento River winter-run Chinook salmon (*Oncorhynchus tshawytscha*), threatened Central Valley spring-run Chinook salmon (CV spring-run Chinook salmon; *O. tshawytscha*), threatened Central Valley steelhead (CV steelhead; *O. mykiss*), and proposed critical habitat for CV spring-run Chinook salmon and CV steelhead, in accordance with section 7 of the Endangered Species Act (ESA) of 1973, as amended (16 U.S.C. 1531 *et seq.*). Your request for formal consultation was received on April 29, 2004. Formal consultation was initiated on October 22, 2004.

On May 16, 2005, NMFS issued a draft biological and conference opinion for the FWD Long-term CVP Water Service Contract Renewal. On June 23, 2005, The Bureau of Reclamation (Reclamation) requested NMFS to finalize the biological and conference opinion and modify the terms and conditions to incorporate language changes that were discussed following the issuance of the draft. This final biological and conference opinion includes four major changes: (1) the *Project Description* was modified to include language from the water contract that clarifies the use of project water during the months of May and October, (2) the *Status of the Species and Critical habitat* section was updated to incorporate the final listing determinations for Central Valley Evolutionarily Significant Units (70 FR 37160), (3) the *Incidental Take Statement* was modified by changing the language of term and condition 1a to improve consistency between the intent of the requirement and the jurisdictional authority of Reclamation, and (4) a conservation recommendation was added suggesting that Reclamation develop and implement coordinated monitoring programs to adaptively manage water and fishery resources in the Feather River.

This biological and conference opinion is based on information provided in the April 2004 biological assessment, the August 2004 Revised Draft Environmental Assessment, and the draft Finding of No Significant Impact, for the proposed project. A complete administrative record of this consultation is on file at the NMFS Sacramento Area Office.

Based on the best available scientific and commercial information, the biological and conference opinion concludes that this project is not likely to jeopardize the continued existence of Sacramento River winter-run Chinook salmon, CV spring-run Chinook salmon, and CV steelhead, or adversely modify their designated or proposed critical habitat. NMFS also has included an incidental take statement with reasonable and prudent measures and non-discretionary terms and conditions that are necessary and appropriate to minimize incidental take associated with the FWD Long-term CVP Water Service Contract Renewal.

The biological and conference opinion finds the proposed action will not result in any adverse effects to designated or proposed critical habitat. Because of this conclusion, NMFS also believes that the project is not likely to adversely affect the Essential Fish Habitat of Pacific salmon identified by the Magnuson-Stevens Fishery Conservation Act (MSA) as amended (U.S.C 180 *et seq.*).

If you have any questions regarding this correspondence please contact Mr. Howard Brown in our Sacramento Area Office, 650 Capitol Mall, Suite 8-300, Sacramento, California 95814. Mr. Brown may be reached by telephone at (916) 930-3608 or by Fax at (916) 930-3629.

Sincerely,

for Rodney R. McInnis
Regional Administrator

Enclosure

Enclosure

BIOLOGICAL AND CONFERENCE OPINION

ACTION AGENCY:	United States Bureau of Reclamation Mid-Pacific Region
ACTIVITY:	Feather River Water District Long-term Central Valley Project Water Service Contract Renewal
CONSULTATION CONDUCTED BY:	Southwest Region, National Marine Fisheries Service
FILE NUMBER:	151422SWR2001SA5686
DATE ISSUED:	JUL 28 2005

I. CONSULTATION HISTORY

In August 2003, the U.S. Bureau of Reclamation (Reclamation) provided NOAA's National Marine Fisheries Service (NMFS) a biological assessment (BA) for the Feather River Water District (FWD) Long-term Central Valley Project (CVP) Water Service Contract Renewal.

Reclamation subsequently revised the BA and requested formal consultation with NMFS for the FWD Long-term CVP Water Service Contract Renewal on April 29, 2004. The BA included a request to review a draft of the biological and conference opinion.

In August 2004, Reclamation provided NMFS with a Revised Draft Environmental Assessment (EA) and the draft Finding of No Significant Impact (FONSI).

On October 22, 2004, NMFS issued a biological opinion on the Long-Term Operations, Criteria, and Plan (OCAP) for the coordinated operations of the CVP and the California State Water Project (SWP). At Reclamation's request, initiation of the FWD Long-term CVP Water Service Contract Renewal section 7 consultation was delayed until completion of the OCAP consultation. The reason for this request was that Reclamation believed that all aquatic concerns would be addressed in the OCAP consultation and, therefore, it was a necessary precursor to completing this contract specific consultation.

Following review of the OCAP biological opinion, we find that the only some of the effects of the FWD Long-term CVP Water Service Contract Renewal on federally-listed endangered Sacramento River winter-run Chinook salmon (*Oncorhynchus tshawytscha*), threatened Central Valley spring-run Chinook salmon (CV spring-run Chinook salmon; *O. tshawytscha*), and threatened Central Valley steelhead (CV steelhead; *O. mykiss*), and the designated critical habitat of winter-run Chinook salmon, were previously analyzed and are included in the incidental take

statement of the OCAP biological opinion as appropriate. The effects that were analyzed in the OCAP biological opinion are system-wide effects that are related to CVP and SWP operations. Impacts to the proposed critical habitat of Central Valley steelhead and Central Valley spring-run Chinook salmon from the contracts, and certain contract-specific issues, such as river flow conditions downstream from the FWD diversion point, juvenile entrainment at pumping stations, and return flows of contaminated agricultural runoff were not analyzed in the OCAP consultation and will be addressed in this biological and conference opinion.

On May 16, 2005, NMFS provided Reclamation with a draft biological and conference opinion for the FWD Long-term CVP Water Service Contract Renewal. The draft biological and conference opinion concluded that this project is not likely to jeopardize the CV spring-run Chinook salmon and CV steelhead, or adversely modify their proposed critical habitat. NMFS also included a draft incidental take statement with reasonable and prudent measures and non-discretionary terms and conditions that are necessary and appropriate to minimize incidental take associated with the FWD Long-term CVP Water Service Contract Renewal.

Between May 16, and June 6, 2005, NMFS and Reclamation discussed the findings of the draft biological and conference opinion and discussed the reasonable and prudent measures and the terms and conditions. Reclamation believed that term and condition 1a was not within their jurisdictional authority because they could not directly require the FWD to minimize pumping. NMFS agreed to revise term and condition 1a to bring consistency between the intent of the term and condition and the jurisdictional scope of Reclamation. NMFS modified the project description to include additional information related to the type of water over which Reclamation has jurisdiction. These discussions also resulted in NMFS developing an additional conservation recommendation that Reclamation should develop and implement coordinated monitoring programs to adaptively manage water and fishery resources in the Feather River.

On June 24, 2005, Reclamation requested NMFS to finalize the draft biological and conference opinion for the FWD Long-term CVP Water Service Contract Renewal. This request included a summary of the reasonable and prudent measures, the terms and conditions, and the conservation recommendations that were discussed between NMFS and Reclamation.

This biological and conference opinion is based on information provided in the April 2004 BA, the August 2004 Revised Draft EA and FONSI, the October 24, 2004, OCAP biological opinion, and discussions held between NMFS and Reclamation. A complete administrative record of this consultation is on file at the NMFS Sacramento Area Office.

II. DESCRIPTION OF THE PROPOSED ACTION

Reclamation proposes to renew the FWD's long-term CVP water service contract for a period of 25 years, from March 1, 2005, to February 28, 2029. The proposed action will execute the long-term contract to provide a maximum of 20 thousand acre feet (TAF) of replacement water per year to the Sacramento River, at the confluence with the Feather River to allow the FWD to pump an equal amount of water from the Feather River, and to provide a concurrent exchange of water to supply the prior rights of the Sacramento River and Sacramento-San Joaquin Delta

users. The proposed action does not include construction, installation, or modification of any new facilities or structures.

A. Project Activities

The FWD typically diverts water from May to October with most of the water diverted from June to September. The water service contract specifies that during the months of June, July, August, and September of each year, all water diverted by the FWD is considered replacement water, except when the California Water Resources Control Board (State Board) determines that insufficient water is available under State Board Permit 12094 during other months, in which case all diversions made by the FWD are considered replacement water. During these months, water that is diverted by the FWD is replaced with CVP water that is delivered in the Sacramento River at the confluence with the Feather River. Table 1 provides a statement of monthly deliveries for the year 2003 which represent typical diversion rates.

Table 1. Feather River Water District monthly water deliveries for 2003.

	May	June	July	August	September	October
Acre Feet Used	269	2,308	3,854	732	1,108	197
Percent of Delivery	3%	27%	46%	9%	9%	2%

Water is delivered to the FWD from Oroville Dam, into the Feather River, and then flows into channels where the water is lifted by a northern pump station east of the Garden Highway, near Messick Road, and a southern pump station at the end of Wilkie Avenue in Sutter County. The northern pump station is approximately 17 miles upstream from the confluence of the Feather and Sacramento Rivers, near Verona, California. The southern pump station is approximately 12.5 miles upstream from the confluence. Both pump stations are at the end of channels that are perpendicular to the Feather River. The channel to the northern pump station is approximately 480 feet long, 320 feet wide, and five feet deep. At the end of the channel is a side-channel that is 96 feet wide and holds four 60-horsepower (hp) pumps, each with an unscreened, 10-inch diameter intake. The channel to the southern pump station is approximately 200 feet long, 50 feet wide, and 5 feet deep. This pump station also contains four 60-hp pumps, and each has an unscreened, 18-inch intake.

The typical pumping rate at the northern intake is approximately 20,000 gallons per minute (gpm), or 45 cubic feet per second (cfs). The typical pumping rate at the southern intake is approximately 12,000 gpm, or 27 cfs. Water velocity in the diversion channels during pumping is estimated to be approximately 0.3 feet per second (fps), depending on river elevations.

All water delivered to the FWD will be measured and recorded with equipment furnished, installed, operated, and maintained by the United States, the FWD, or other appropriate entity, as designated by Reclamation at the established points of delivery. Annual CVP contract water delivery to the FWD will not exceed the historical maximum of 20 TAF. Actual water delivery may vary based on Reclamation's annual allocation. Annual water delivery over a 10-year

period from 1989 to 1998 ranged from approximately 5 to 21 TAF, and averaged 10.7 TAF. Return flows are recycled, with any surplus draining into Gilseizer Slough.

B. Action Area

The action area is defined as all areas to be affected directly or indirectly by the Federal action and not merely the immediate area involved in the action (50 CFR §402.02). The action area, for the purposes of this biological and conference opinion, is located on the Feather River between river mile (RM) 17 and RM 0. This includes all water bodies accessible to anadromous salmonids that are influenced by water diversions. This area was selected because it comprises the reach of the Feather River between the most upstream diversion point and the mouth, below which flows will be restored as described above. The Sacramento River and the designated critical habitat of Sacramento River winter-run Chinook salmon are not included in the action area because Reclamation will restore flows diverted by the FWD with releases from Shasta Reservoir.

III. STATUS OF THE SPECIES AND CRITICAL HABITAT

This biological and conference opinion analyzes the effects of the FWD Long-term Water Service Contract Renewal on the following threatened and endangered species and proposed critical habitat:

Sacramento River winter-run Chinook salmon - endangered
Central Valley spring-run Chinook salmon - threatened
Central Valley spring-run Chinook salmon - proposed critical habitat
Central Valley steelhead - threatened
Central Valley steelhead - proposed critical habitat

A. Species Life History, Population Dynamics, and Likelihood of Survival and Recovery

1. Sacramento River winter-run Chinook salmon

Sacramento River winter-run Chinook salmon were originally listed as threatened in November, 1990 (55 FR 46515). Their status was reclassified as endangered in January 1994 (59 FR 440) due to continued decline and increased variability of run sizes since their listing as a threatened species, expected weak returns as a result of two small year classes in 1991 and 1993, and continued threats to the population. In the proposed rule to reclassify the winter-run Chinook salmon as endangered, NMFS recognized that the population had dropped nearly 99 percent between 1966 and 1991, and despite conservation measures to improve habitat conditions, the population continued to decline (57 FR 27416). In June 2004 NOAA Fishery proposed to reclassify Sacramento River winter-run Chinook salmon as threatened (69 FR 33102). This determination was based on three main points: (1) harvest and habitat conservation efforts have increased the abundance and productivity of the Evolutionarily Significant Unit (ESU) over the past decade; (2) artificial propagation programs that are part of the ESU (*i.e.*, the Captive Broodstock Programs at Livingston Stone National Fish Hatchery (LSNFH) and at the

University of California Bodega Marine Laboratory) contribute to the ESU's viability; and (3) California Bay-Delta Authority (CALFED) ecosystem restoration plans underway in Battle Creek should provide the opportunity to establish a second winter-run Chinook salmon population. However, on June 28, 2005, after reviewing the best available scientific and commercial information, NMFS issued its final decision to retain the status of Sacramento River winter-run Chinook salmon as endangered (70 FR 37160). This decision was based on the continued threats to Sacramento River winter-run Chinook salmon and the continued likelihood of this ESU becoming extinct throughout all or a significant portion of its range. A draft recovery plan was published in August 1997 (NMFS 1997).

Winter-run Chinook salmon historically spawned in the headwaters of the McCloud, Pit, and Little Sacramento Rivers and Hat and Battle Creeks. Construction of Shasta Dam in 1943 and Keswick Dam in 1950 blocked access to all of these waters except Battle Creek, which has been severely impacted by hydroelectric facilities and the Coleman National Fish Hatchery (Moyle *et al.* 1989, NMFS 1997a). Until 1984, the upper Calaveras River also contained a run of several dozen to several hundred fish that spawned below New Hogan Dam. According to the California Department of Fish and Game (CDFG), low river flows in the Calaveras during the 1987-1992 drought are believed to have eliminated this population (CDFG 1998). Most of the current winter-run Chinook salmon spawning and rearing habitat exists on the mainstem Sacramento River between Keswick Dam and Red Bluff Diversion Dam (RBDD). Although a small, unknown, number of winter-run Chinook salmon are thought to spawn in Battle Creek, the ESU is widely considered to be reduced to a single naturally spawning population in the mainstem Sacramento River below Keswick Dam. Following the construction of Shasta Dam, the number of winter-run Chinook salmon initially declined but recovered during the 1960s. This initial recovery was followed by a steady decline from 1969 through the late 1980s (U.S. Fish and Wildlife Service (FWS) 1999).

Adult winter-run Chinook salmon enter San Francisco Bay from November through June (Hallock and Fisher 1985) and migrate past RBDD from mid-December through early August (NMFS 1997a). The majority of the run passes RBDD from January through May, and peaks in mid-March (Hallock and Fisher 1985). Generally, winter-run Chinook salmon spawn from near Keswick Dam, downstream to Red Bluff. Spawning occurs from late-April through mid-August with peak activity between May and June. Eggs and pre-emergent fry require water temperatures at or below 56 °F for maximum survival during the spawning and incubation period (FWS 1999). Fry emerge from mid-June through mid-October and move to river margins and tributary streams to rear. Emigration past RBDD may begin in mid-July and typically peaks in September and can continue through March in dry years (NMFS 1997a, Vogel and Marine 1991). From 1995 to 1999, all winter-run Chinook salmon outmigrating as fry passed RBDD by October, and all outmigrating pre-smolts and smolts passed RBDD by March (Martin *et al.* 2001).

Construction of RBDD in 1966 enabled improved accuracy of population estimates as salmon passed through fish ladders. From 1967 to 2000, winter-run Chinook salmon estimates were extrapolated from adult counts at RBDD ladders. Recent operational changes at RBDD have allowed a majority of the winter-run Chinook salmon population to bypass the ladders and counting facilities, and have increased the error associated with extrapolating the population

estimate. Beginning in 2001, carcass counts replaced the ladder count to reduce the error associated with the estimate.

Since 1967, the estimated adult winter-run Chinook salmon population ranged from 186 in 1994 to 117,808 in 1969 (CDFG 2002). The estimate declined from an average of 86,000 adults in 1967-1969 to only 2,000 by 1987-1989, and continued downward to an average 830 fish in 1994-1996. Since then, estimates have increased to an average of 3,136 fish for the period of 1998-2001. Winter-run abundance estimates and cohort replacement rates since 1986 are shown in Table 2. Although the population estimates display broad fluctuation since 1986 (186 in 1994 to 9,757 in 2003), there is an increasing trend in the five-year moving average over the last five year period (491 from 1990-1994 to 5,818 from 1999-2003), and a generally stable trend in the five-year moving average of cohort replacement rates. The 2003 run was the highest since the listing, with an estimate of 9,757 adult fish.

Table 2. Winter-run Chinook salmon population estimates from RBDD ladder counts, and corresponding cohort replacement rates for years since 1986. Population estimates include both adult and grilse.

Year	Population Estimate	5-Year Moving Average of Population Estimate	Cohort Replacement Rate	5-Year Moving Average of Cohort Replacement Rate
1986	2,596	-	-	-
1987	2,186	-	-	-
1988	2,886	-	-	-
1989	697	-	0.3	-
1990	431	1,759	0.2	-
1991	211	1,282	0.1	-
1992	1,241	1,093	1.8	-
1993	387	593	0.9	0.6
1994	186	491	0.9	0.8
1995	1,297	664	1.1	0.9
1996	1,337	890	3.5	1.6
1997	880	817	4.7	2.2
1998	3,002	1,340	2.3	2.5
1999	3,288	1,961	2.5	2.8
2000	1,352	1,972	1.5	2.9
2001	5,521	2,809	1.8	2.6
2002	9,172	4,467	2.3	2.2
2003	9,757	5,818	7.2	3.2

2. Central Valley Spring-Run Chinook Salmon

NMFS listed the CV spring-run Chinook salmon evolutionarily significant unit (ESU) as threatened on September 16, 1999 (64 FR 50394). In June 2004 NMFS proposed that CV spring-run Chinook salmon remain listed as threatened (69 FR 33102). This proposal was based

on the recognition that although CV spring-run Chinook salmon productivity trends are positive, the ESU continues to face risks from having a limited number of remaining metapopulations (*i.e.,* three existing populations from an estimated 17 historical populations), a limited geographic distribution, and potential hybridization with Feather River Hatchery spring-run Chinook salmon which are not in the ESU and display genetic similarities to fall-run Chinook salmon. On June 28, 2005, after reviewing the best available scientific and commercial information, NMFS issued its final decision to retain the status of CV spring-run Chinook salmon as threatened (70 FR 37160). This decision also included the Feather River Hatchery (FRH) spring-run Chinook salmon population included as part of the Central Valley spring-run Chinook salmon ESU.

Adult spring-run Chinook salmon enter the Sacramento-San Joaquin Delta (Delta) from the Pacific Ocean beginning in January and enter natal streams from March to July. In Mill Creek, Van Woert (1964) noted that of 18,290 spring-run Chinook salmon observed from 1953 to 1963, 93.5 percent were counted between April 1 and July 14, and 89.3 percent were counted between April 29 and June 30.

During their upstream migration, adult Chinook salmon require streamflows sufficient to provide olfactory and other orientation cues used to locate their natal streams. Adequate streamflows also are necessary to allow adult passage to upstream holding habitat. The preferred temperature range for upstream migration is 38 to 56°F (Bell 1991, CDFG 1998).

Upon entering fresh water, spring-run Chinook salmon are sexually immature and must hold in cold water for several months to mature. Typically, spring-run Chinook salmon utilize mid-to high-elevation streams that provide appropriate temperatures and sufficient flow, cover, and pool depth to allow over-summering. Spring-run Chinook salmon also may utilize tailwaters below dams if cold water releases provide suitable habitat conditions. Spawning occurs between September and October and, depending on water temperature, emergence occurs between November and February.

Spring-run Chinook salmon emigration is highly variable (CDFG 1998). Some may begin outmigrating soon after emergence, whereas others oversummer and emigrate as yearlings with the onset of increased fall storms (CDFG 1998). The emigration period for spring-run Chinook salmon extends from November to early May, with up to 69 percent of young-of-the-year outmigrants passing through the lower Sacramento River between mid-November and early January (Snider and Titus 2000). Outmigrants also are known to rear in non-natal tributaries to the Sacramento River and the Delta (CDFG 1998).

Chinook salmon spend between one and four years in the ocean before returning to their natal streams to spawn (Myers *et al.* 1998). Fisher (1994) reported that 87 percent of Chinook trapped and examined at RBDD between 1985 and 1991 were three-year-olds.

Spring-run Chinook salmon were once the most abundant run of salmon in the Central Valley (Campbell and Moyle 1992) and were found in both the Sacramento and San Joaquin drainages. More than 500,000 spring-run Chinook salmon were caught in the Sacramento-San Joaquin commercial fishery in 1883 alone (Yoshiyama *et al.* 1998). The San Joaquin populations were

essentially extirpated by the 1940s, with only small remnants of the run that persisted through the 1950s in the Merced River (Hallock and Van Woert 1959, Yoshiyama *et al.* 1998). Populations in the upper Sacramento, Feather, and Yuba Rivers were eliminated with the construction of major dams during the1950s and 1960s. Naturally spawning populations of spring-run Chinook salmon are currently restricted to accessible reaches of the upper Sacramento River, Antelope Creek, Battle Creek, Beegum Creek, Big Chico Creek, Butte Creek, Clear Creek, Deer Creek, Mill Creek, Feather River, and the Yuba River (CDFG 1998).

Since 1969, the spring-run Chinook salmon ESU has displayed broad fluctuations in abundance, ranging from 1,403 in 1993 to 25,890 in 1982 (CDFG 2003). The average abundance for the ESU was 12,590 for the period of 1969 to 1979, 13,334 for the period of 1980 to 1990, and 6,554 from 1991 to 2001. Evaluating the abundance of the ESU as a whole, however, complicates trend detection. For example, although the mainstem Sacramento River population appears to have undergone a significant decline, the data are not necessarily comparable because coded wire tag information gathered from fall-run Chinook salmon returns since the early 1990s has resulted in adjustments to ladder counts at RBDD that have reduced the overall number of fish that are categorized as spring-run Chinook salmon (Colleen Harvey-Arrison, CDFG, pers. comm., 2003).

Sacramento River tributary populations in Mill, Deer, and Butte Creeks are probably the best trend indicators for the CV spring-run Chinook ESU as a whole. These streams have shown positive escapement trends since 1991. Recent escapements to Butte Creek, including 20,259 in 1998, 9,605 in 2001 and 8,785 in 2002 (CDFG 2002, CDFG 2003), represent the greatest proportion of the ESU's abundance. Although recent trends are positive, annual abundance estimates display a high level of fluctuation, and the overall number of CV spring-run Chinook salmon remains well below estimates of historic abundance. Additionally, in 2003, high water temperatures, high fish densities, and an outbreak of Columnaris Disease (*Flexibacter columnaris*) and Ichthyophthiriasis (*Ichthyophthirius multifiliis*) contributed to the pre-spawning mortality of an estimated 11,231 adult spring-run Chinook salmon in Butte Creek. Because the CV spring-run Chinook salmon ESU is confined to relatively few remaining streams, continues to display broad fluctuations in abundance, and a large proportion of the population (*i.e.*, in Butte Creek) faces the risk of high mortality rates, the population is at a moderate to high risk of extinction.

3. Central Valley Steelhead

NMFS listed the CV steelhead ESU as threatened on March 19, 1998 (63 FR 13347). The ESU includes all naturally-produced CV steelhead in the Sacramento-San Joaquin River Basin. NMFS published a final 4(d) rule for steelhead on July 10, 2000 (65 FR 42422). The 4(d) rule applies the section 9 take prohibitions to threatened species except in cases where the take is associated with State and local programs that are approved by NMFS. In June 2004 NMFS proposed that CV steelhead remain listed as threatened (69 FR 33102). This proposal is based on the recognition that although the NMFS Biological Review Team (BRT) (NMFS 2003) found the ESU "in danger of extinction," ongoing protective efforts for this ESU, and the likely implementation of an ESU-wide monitoring program effectively counter this finding. NMFS also is proposing changes involving steelhead hatchery populations (69 FR 31354). The Coleman National Fish Hatchery and Feather River Fish Hatchery steelhead populations are

proposed for inclusion in the listed population of steelhead. These populations previously were included in the ESU but were not deemed essential for conservation and thus not part of the listed steelhead population. Finally, NMFS has proposed to include resident *Oncorhynchus mykiss,* present below natural or long-standing artificial barriers, in all steelhead ESUs (69 FR 33102). The final decisions on these steelhead proposals have been deferred for six months for further scientific review (70 FR 37160).

All steelhead stocks in the Central Valley are winter-run steelhead (McEwan and Jackson 1996). Steelhead are similar to Pacific salmon in their life history requirements. They are born in fresh water, emigrate to the ocean, and return to freshwater to spawn. Unlike other Pacific salmon, steelhead are capable of spawning more than once before they die.

The majority of the CV steelhead spawning migration occurs from October through February and spawning occurs from December to April in streams with cool, well oxygenated water that is available year round. Van Woert (1964) and Harvey (1995) observed that in Mill Creek, the CV steelhead migration is continuous, and although there are two peak periods, sixty percent of the run is passed by December 30. Similar bimodal run patterns have also been observed in the Feather River (Brad Cavallo, California Department of Water Resources (DWR), pers. comm., 2002), and the American River (John Hannon, Bureau of Reclamation, pers. comm., 2002).

Incubation time is dependent upon water temperature. Eggs incubate for one and a half to four months before emerging. Eggs held between 50 and 59 °F hatch within three to four weeks (Moyle 1976). Fry emerge from redds within in about four to six weeks depending on redd depth, gravel size, siltation, and temperature (Shapovalov and Taft 1954). Newly emerged fry move to shallow stream margins to escape high water velocities and predation (Barnhart 1986). As fry grow larger they move into riffles and pools and establish feeding locations. Juveniles rear in freshwater for one to four years (Meehan and Bjornn 1991) emigrating episodically from natal springs during fall, winter and spring high flows (Colleen Harvey Arrison, CDFG, pers. comm. 1999). Steelhead typically spend two years in fresh water. Adults spend one to four years at sea before returning to freshwater to spawn as four or five year olds (Moyle 1976).

Steelhead historically were well-distributed throughout the Sacramento and San Joaquin Rivers (Busby *et al.* 1996). Steelhead were found from the upper Sacramento and Pit River systems south to the Kings and possible the Kern River systems and in both east- and west-side Sacramento River tributaries (Yoshiyama *et al.* 1996). The present distribution has been greatly reduced (McEwan and Jackson 1996). The California Advisory Committee on Salmon and Steelhead (1988) reported a reduction of steelhead habitat from 6,000 miles historically to 300 miles. The California Fish and Wildlife Plan (CDFG 1965) estimated there were 40,000 steelhead in the early 1950s. Hallock *et al.* (1961) estimated an average of 20,540 adult steelhead through the 1960s in the Sacramento River, upstream of the Feather River.

Nobriga and Cadrett (2003) compared coded-wire tagged (CWT) and untagged (wild) steelhead smolt catch ratios at Chipps Island trawl from 1998-2001 to estimate that about 100,000 to 300,000 steelhead juveniles are produced naturally each year in the Central Valley. In the draft *Updated Status Review of West Coast Salmon and Steelhead* (NMFS 2003), the BRT made the following conclusion based on the Chipps Island data:

"If we make the fairly generous assumptions (in the sense of generating large estimates of spawners) that average fecundity is 5,000 eggs per female, 1 percent of eggs survive to reach Chipps Island, and 181,000 smolts are produced (the 1998-2000 average), about 3,628 female steelhead spawn naturally in the entire Central Valley. This can be compared with McEwan's (2001) estimate of 1 million to 2 million spawners before 1850, and 40,000 spawners in the 1960s".

The only consistent data available on steelhead numbers in the San Joaquin River basin come from CDFG mid-water trawling samples collected on the lower San Joaquin River at Mossdale. These data indicate a decline in steelhead numbers in the early 1990s, which have remained low through 2002 (CDFG 2003). In 2003, a total of only 12 steelhead smolts were collected at Mossdale (CDFG, unpublished data).

Existing wild steelhead stocks in the Central Valley mostly are confined to upper Sacramento River and its tributaries, including Antelope, Deer, and Mill Creeks and the Yuba River. Populations may exist in Big Chico and Butte Creeks and a few wild steelhead are produced in the American and Feather Rivers (McEwan and Jackson 1996). Until recently, CV steelhead were thought to be extirpated from the San Joaquin River system. Recent monitoring has detected populations of steelhead in the Stanislaus, Mokelumne, and Calaveras Rivers, and other streams previously thought to be void of steelhead (McEwan 2001). Naturally spawning populations may exist in many other streams but are undetected due to lack of monitoring programs (Interagency Ecological Program Steelhead Project Work Team (SPWT) 1999).

Reliable estimates of CV steelhead abundance for different basins are not available (McEwan 2001), however, McEwan and Jackson (1996) estimate the total annual run size for the entire Sacramento-San Joaquin system, based on RBDD counts, to be no more than 10,000 adults. Steelhead counts at the RBDD have declined from an average of 11,187 for the period of 1967 to 1977, to an average of approximately 2,000 through the 1990s (McEwan and Jackson 1996, McEwan 2001). The future of CV steelhead is uncertain because of the lack of status and trend data.

B. Habitat Condition and Function for Species' Conservation

Designated critical habitat for Sacramento River winter-run Chinook salmon does not occur in the action area. NMFS proposed to designate critical habitat for CV spring-run Chinook salmon and CV steelhead in December 2004 (69 FR 71880). Proposed critical habitat includes stream channels within certain occupied stream reaches and includes a lateral extent as defined by the ordinary high water mark (33 CFR 329.11) or the bankfull elevation. Critical habitat in estuarine reaches is defined by the perimeter of the water body or the elevation of the extreme high water mark, whichever is greater. The reach of the Feather River that contains the action area currently is proposed.

The freshwater habitat of salmon and steelhead in the Central Valley varies in function depending on location. Spawning areas are located in accessible, upstream reaches of the Sacramento or San Joaquin Rivers and their watersheds where viable spawning gravels and

water conditions are found. Spawning habitat condition is strongly affected by water flow and quality, especially temperature, dissolved oxygen, and silt load, all of which can greatly affect the survival of eggs and larvae.

Migratory corridors are downstream of the spawning area and include the Sacramento-San Joaquin Delta. These corridors allow the upstream passage of adults, and the downstream emigration of outmigrant juveniles. Migratory habitat condition is strongly affected by the presence of barriers, which can include dams, unscreened or poorly-screened diversions, and degraded water quality.

Both spawning areas and migratory corridors comprise rearing habitat for juveniles, which feed and grow before and during their outmigration. Non-natal, intermittent tributaries also may be used for juvenile rearing. Rearing habitat condition is strongly affected by habitat complexity, food supply, and presence of predators of juvenile salmonids. Some complex, productive habitats with floodplains remain in the system (*e.g.*, the lower Cosumnes and Sacramento River reaches with setback levees [*i.e.*, primarily located upstream of the City of Colusa]). However, the channelized, leveed, and rip-rapped river reaches and sloughs that are common in the Sacramento-San Joaquin system typically have low habitat complexity, low abundance of food organisms, and offer little protection from either fish or avian predators.

C. Factors Affecting the Species and Habitat

A number of documents have addressed the history of human activities, present environmental conditions, and factors contributing to the decline of salmon and steelhead species in the Central Valley. For example, NMFS prepared range-wide status reviews for west coast Chinook salmon (Myers *et al.* 1998) and steelhead (Busby *et al.* 1996). Also, the NOAA BRT published a draft updated status review for west coast Chinook salmon and steelhead in November 2003 (NMFS 2003). Information also is available in Federal Register notices announcing ESA listing proposals and determinations for some of these species and their critical habitat (*e.g.*, 58 FR 33212, 59 FR 440, 62 FR 24588, 62 FR 43937, 63 FR 13347, 64 FR 24049, 64 FR 50394, 65 FR 7764). The Final Programmatic Environmental Impact Statement/Report (EIS/EIR) for the CALFED Bay-Delta Program (CALFED 1999) and the Final Programmatic EIS for the Central Valley Project (CVPIA) (Department of Interior (DOI) 1999) provide a summary of historical and recent environmental conditions for salmon and steelhead in the Central Valley. The following general description of the factors affecting the viability of Sacramento River winter-run Chinook salmon, CV spring-run Chinook salmon, CV steelhead is based on a summarization of these documents.

In general, the human activities that have affected the listed anadromous salmonids and their habitats addressed in this opinion consist of: (1) dam construction that blocks previously accessible habitat; (2) water development and management activities that affect water quantity, flow timing, and quality; (3) land use activities such as agriculture, flood control, urban development, mining, road construction, and logging that degrade aquatic and riparian habitat; (4) hatchery operation and practices; (5) harvest activities; (6) predation; and (7) ecosystem restoration actions.

1. Habitat Blockage

Hydropower, flood control, and water supply dams of the CVP, SWP, and other municipal and private entities have permanently blocked or hindered salmonid access to historical spawning and rearing grounds. Clark (1929) estimated that originally there were 6,000 miles of salmon habitat in the Central Valley system and that 80 percent of this habitat had been lost by 1928. Yoshiyama *et al.* (1996) calculated that roughly 2,000 miles of salmon habitat was actually available before dam construction and mining, and concluded that 82 percent is not accessible today.

In general, large dams on every major tributary to the Sacramento River, San Joaquin River, and Sacramento-San Joaquin Delta block salmon and steelhead access to the upper portions of the respective watersheds. On the Sacramento River, Keswick Dam blocks passage to historic spawning and rearing habitat in the upper Sacramento, McCloud, and Pit Rivers. Whiskeytown Dam blocks access to the upper watershed of Clear Creek. Oroville Dam and associated facilities block passage to the upper Feather River watershed. Nimbus Dam blocks access to most of the American River basin. Friant Dam construction in the mid-1940s has been associated with the elimination of spring-run Chinook salmon in the San Joaquin River upstream of the Merced River (DOI 1999). On the Stanislaus River, construction of New Melones Dam and Goodwin Dam blocked both spring and fall-run Chinook salmon (CDFG 2001).

As a result of the dams, Sacramento River winter-run Chinook salmon, CV Chinook salmon, and CV steelhead populations on these rivers have been confined to lower elevation mainstems that historically only were used for migration. Population abundances have declined in these streams due to decreased quantity and quality of spawning and rearing habitat. Higher temperatures at these lower elevations during late-summer and fall are a major stressor to adults and juvenile salmonids.

The Suisun Marsh Salinity Control Gates (SMSCG), located on Montezuma Slough, were installed in 1988, and are operated with gates and flashboards to decrease the salinity levels of managed wetlands in Suisun Marsh. The SMSCG have delayed or blocked passage of adult Chinook salmon migrating upstream (Edwards *et al.* 1996, Tillman *et al.* 1996, DWR 2002).

2. Water Development

The diversion and storage of natural flows by dams and diversion structures on Central Valley waterways have depleted stream flows and altered the natural cycles by which juvenile and adult salmonids base their migrations. Depleted flows have contributed to higher temperatures, lower dissolved oxygen levels, and decreased recruitment of gravel and large woody debris. Furthermore, more uniform flows year round have resulted in diminished natural channel formation, altered food web processes, and slower regeneration of riparian vegetation. These stable flow patterns have reduced bedload movement (Ayers 2001) and caused spawning gravels to become embedded, and reduced channel width, which has decreased the available spawning and rearing habitat below dams.

Water diversions for irrigated agriculture, municipal and industrial use, and managed wetlands are found throughout the Central Valley. Hundreds of small and medium-size water diversions exist along the Sacramento River, San Joaquin River, and their tributaries. Although efforts have been made in recent years to screen some of these diversions, many remain unscreened. Depending on the size, location, and season of operation, these unscreened intakes entrain and kill many life stages of aquatic species, including juvenile salmonids. For example, as of 1997, 98.5 percent of the 3,356 diversions included in a Central Valley database were either unscreened or screened insufficiently to prevent fish entrainment (Herren and Kawasaki 2001). Most of the 370 water diversions operating in Suisun Marsh are unscreened (FWS 2003).

Outmigrant juvenile salmonids in the Delta have been subjected to adverse environmental conditions created by water export operations at the CVP/SWP. Specifically, juvenile salmonid survival has been reduced from (1) water diversion from the mainstem Sacramento River into the Central Delta via the Delta Cross Channel; (2) upstream or reverse flows of water in the lower San Joaquin River and southern Delta waterways; (3) entrainment at the CVP/SWP export facilities and associated problems at Clifton Court Forebay; and (4) increased exposure to introduced, non-native predators such as striped bass (*Morone saxatilis*), largemouth bass (*Micropterus salmoides*), and American shad (*Alosa sapidissima*).

The OCAP consultation was completed with the issuance of a biological opinion by NOAA Fisheries on October 22, 2004. The OCAP biological opinion found that CVP and SWP actions are likely to adversely affect federally-listed Sacramento River winter-run Chinook salmon, Central Valley spring-run Chinook salmon, and Central Valley steelhead, and the critical habitat of winter-run Chinook salmon, due to reservoir releases, Sacramento River flows, water temperatures, and physical facility operations that reduce habitat availability and suitability. These effects are expected to impact and result in the take of individual fish by delaying or blocking adult migration into suitable spawning habitat and decreasing spawning success, killing vulnerable life stages such as eggs, larvae, and juveniles due to stranding or elevated water temperatures, or increasing the likelihood of disease or juvenile vulnerability to predation due to temperature stress. NMFS determined that these effects are not likely to jeopardize the continued existence of Sacramento River winter-run Chinook salmon, Central Valley spring-run Chinook salmon, or Central Valley steelhead, and is not likely to destroy or adversely modify the designated critical habitat Sacramento River winter-run Chinook salmon.

3. Land Use Activities

Land use activities continue to have large impacts on salmonid habitat in the Central Valley. Until about 150 years ago, the Sacramento River was bordered by up to 500,000 acres of riparian forest, with bands of vegetation extending outward for four or five miles (California Resources Agency 1989). By 1979, riparian habitat along the Sacramento River had diminished to 11,000 to 12,000 acres, or about 2 percent of historic levels (McGill 1987). The degradation and fragmentation of riparian habitat had resulted mainly from flood control and bank protection projects, together with the conversion of riparian land to agriculture (Jones and Stokes Associates, Incorporated 1993).

Increased sedimentation resulting from agricultural and urban practices within the Central Valley is a primary cause of salmonid habitat degradation (NMFS 1996). Sedimentation can adversely affect salmonids during all freshwater life stages by clogging or abrading gill surfaces, adhering to eggs, or impeding fry emergence (Phillips and Campbell 1961); burying eggs or alevins, scouring and filling in pools and riffles, or reducing primary productivity and photosynthesis activity (Cordone and Kelley 1961); and affecting intergravel permeability and dissolved oxygen levels. Excessive sedimentation over time can cause substrates to become embedded, which reduces successful salmonid spawning, and egg and fry survival (Hartmann *et al.* 1987).

Land use activities associated with road construction, urban development, logging, mining, agriculture, and recreation have significantly altered fish habitat quantity and quality through alteration of streambank and channel morphology, alteration of ambient water temperatures, degradation of water quality, elimination of spawning and rearing habitat, fragmentation of available habitats, elimination of downstream recruitment of LWD, and removal of riparian vegetation resulting in increased streambank erosion (Meehan and Bjornn 1991). Agricultural practices in the Central Valley have eliminated large trees and logs and other woody debris that would otherwise be recruited into the stream channel (NMFS 1998). LWD influences stream morphology by affecting channel pattern, position, and geometry, as well as pool formation (Keller and Swanson 1979, Bilby 1984, Robison and Beschta 1990).

Since the 1850s, wetlands reclamation for urban and agricultural development has caused the cumulative loss of 79 and 94 percent of the tidal marsh habitat in the Sacramento-San Joaquin Delta downstream and upstream of Chipps Island, respectively (Monroe and Kelly 1992, Goals Project 1999). In Suisun Marsh, salt water intrusion and land subsidence gradually has led to the decline of agricultural production. Presently, Suisun Marsh consists largely of tidal sloughs and managed wetlands for duck clubs.

Juvenile salmonids are exposed to increased water temperatures in the Delta during the late spring and summer due to the loss of riparian shading, and by thermal inputs from municipal, industrial, and agricultural discharges. Studies by the California Department of Water Resources (DWR) on water quality in the Delta over the last 30 years show a steady decline in the food sources available for juvenile salmonids and an increase in the clarity of the water. These conditions have contributed to increased mortality of juvenile Chinook salmon and steelhead as they move through the Delta.

4. Hatchery Operations and Practices

Five hatcheries currently produce Chinook salmon in the Central Valley and four of these also produce steelhead. Releasing large numbers of hatchery fish can pose a threat to wild Chinook salmon and steelhead stocks through genetic impacts, competition for food and other resources between hatchery and wild fish, predation of hatchery fish on wild fish, and increased fishing pressure on wild stocks as a result of hatchery production (Waples 1991). The genetic impacts of artificial propagation programs in the Central Valley primarily are caused by straying of hatchery fish and the subsequent interbreeding of hatchery fish with wild fish. In the Central Valley, practices such as transferring eggs between hatcheries and trucking smolts to distant sites for release contribute to elevated straying levels (DOI 1999). For example, Nimbus Hatchery on

the American River rears Eel River steelhead stock and releases these fish in the Sacramento River.

Hatchery practices as well as spatial and temporal overlaps of habitat use and spawning activity between spring- and fall-run fish have led to the hybridization and homogenization of some subpopulations (CDFG 1998). As early as the 1960s, Slater (1963) observed that early fall- and spring-run Chinook salmon were competing for spawning sites in the Sacramento River below Keswick Dam, and speculated that the two runs may have hybridized. Feather River Hatchery (FRH) spring-run Chinook salmon have been documented as straying throughout the Central Valley for many years (CDFG 1998), and in many cases have been recovered from the spawning grounds of fall-run Chinook salmon (Colleen Harvey-Arrison and Paul Ward, CDFG, pers. comm., 2002), an indication that FRH spring-run Chinook salmon may exhibit fall-run life history characteristics. Although the degree of hybridization has not been comprehensively determined, it is clear that the populations of spring-run Chinook salmon spawning in the Feather River and counted at RBDD contain hybridized fish.

The management of hatcheries, such as Nimbus Hatchery and FRH, can directly impact CV spring-run Chinook salmon and CV steelhead populations by overproducing the natural capacity of the limited habitat available below dams. In the case of the Feather River, significant redd superimposition occurs in-river due to hatchery overproduction and the inability to physically separate CV spring-run and fall-run Chinook salmon adults. This concurrent spawning has led to hybridization between the spring- and fall-run Chinook salmon in the Feather River. At Nimbus Hatchery, operating Folsom Dam to meet temperature requirements for returning hatchery fall-run Chinook salmon often limits the amount if water available for steelhead spawning and rearing the rest of the year.

The increase in Central Valley hatchery production has reversed the composition of the steelhead population, from 88 percent naturally-produced fish in the 1950s (McEwan 2001) to an estimated 23 to 37 percent naturally-produced fish currently (Nobriga and Cadrett 2001). The increase in hatchery steelhead production proportionate to the wild population has reduced the viability of the wild steelhead populations, increased the use of out-of-basin stocks for hatchery production, and increased straying (NMFS 2001). Thus, the ability of natural populations to successfully reproduce has likely been diminished.

The relatively low number of spawners needed to sustain a hatchery population can result in high harvest-to-escapements ratios in waters where regulations are set according to hatchery population. This can lead to over-exploitation and reduction in size of wild populations coexisting in the same system (McEwan 2001).

Hatcheries also can have some positive effects on salmonid populations. Artificial propagation has been shown effective in bolstering the numbers of naturally spawning fish in the short term under certain conditions, and in conserving genetic resources and guarding against catastrophic loss of naturally spawned populations at critically low abundance levels, such as Sacramento River winter-run Chinook salmon. However, relative abundance is only one component of a viable salmonid population.

5. Ocean and Sport Harvest

Extensive ocean recreational and commercial troll fisheries for Chinook salmon exist along the Central California coast, and an inland recreational fishery exists in the Central Valley for Chinook salmon and steelhead. Ocean harvest of Central Valley Chinook salmon is estimated using an abundance index, called the Central Valley Index (CVI). The CVI is the ratio of Chinook salmon harvested south of Point Arena (where 85 percent of Central Valley Chinook salmon are caught) to escapement. CWT returns indicate that Sacramento River salmon congregate off the coast between Point Arena and Morro Bay.

Historically in California, almost half of the river sportfishing effort was in the Sacramento-San Joaquin River system, particularly upstream from the city of Sacramento (Emmett *et al.* 1991). Since 1987, the Fish and Game Commission has adopted increasingly stringent regulations to reduce and virtually eliminate the in-river sport fishery for winter-run Chinook salmon. Present regulations include a year-round closure to Chinook salmon fishing between Keswick Dam and the Deschutes Road Bridge and a rolling closure to Chinook salmon fishing on the Sacramento River between the Deschutes River Bridge and the Carquinez Bridge. The rolling closure spans the months that migrating adult winter-run Chinook salmon are ascending the Sacramento River to their spawning grounds. These closures have virtually eliminated impacts on winter-run Chinook salmon caused by recreational angling in freshwater. In 1992, the California Fish and Game Commission adopted gear restrictions (all hooks must be barbless and a maximum of 5.7 cm in length) to minimize hooking injury and mortality of winter-run Chinook salmon caused by trout anglers.

In-river recreational fisheries historically have taken CV spring-run Chinook salmon throughout the species' range. During the summer, holding adult CV spring-run Chinook salmon are easily targeted by angler's when they congregate in large pools. Poaching also occurs at fish ladders, and other areas where adults congregate; however, the significance of poaching on the adult population is unknown. Specific regulations for the protection of CV spring-run Chinook salmon in Mill, Deer, Butte and Big Chico Creeks were added to the existing CDFG regulations in 1994. The current regulations, including those developed for winter-run Chinook salmon, provide some level of protection for CV spring-run Chinook salmon (CDFG 1998).

There is little information on steelhead harvest rates in California. Hallock *et al.* (1961) estimated that harvest rates for Sacramento River steelhead from the 1953-54 through 1958-59 seasons ranged from 25.1 percent to 45.6 percent assuming a 20 percent non-return rate of tags. Staley (1975) estimated the harvest rate in the American River during the 1971-1972 and 1973-74 seasons to be 27 percent. The average annual harvest rate of adult steelhead above Red Bluff Diversion Dam for the three year period from 1991-92 through 1993-94 was 16 percent (McEwan and Jackson 1996). Since 1998, all hatchery steelhead have been marked with an adipose fin clip allowing anglers to distinguish hatchery and wild steelhead. Current regulations restrict anglers from keeping unmarked steelhead in Central Valley streams (CDFG 2004). Overall, this regulation has greatly increased protection of naturally produced adult CV steelhead.

6. Predation

Accelerated predation also may be a factor in the decline of winter-run Chinook salmon and CV spring-run Chinook salmon, and to a lesser degree CV steelhead. Additionally, human-induced habitat changes such alteration of natural flow regimes and installation of bank revetment and structures such as dams, bridges, water diversions, piers, and wharves often provide conditions that both disorient juvenile salmonids and attract predators (Stevens 1961, Vogel *et al.* 1988, Garcia 1989, Decato 1978).

On the mainstem Sacramento River, high rates of predation are known to occur at RBDD, Anderson Cottonwood Irrigation District (ACID), Glenn Colusa Irrigation District (GCID), areas where rock revetment has replaced natural river bank vegetation, and at south Delta water diversion structures (*e.g.,* Clifton Court Forebay; CDFG 1998). Predation at RBDD on juvenile winter-run Chinook salmon is believed to be higher than normal due to factors such as water quality and flow dynamics associated with the operation of this structure. Due to their small size, early emigrating winter-run Chinook salmon may be very susceptible to predation in Lake Red Bluff when the RBDD gates remain closed in summer and early fall (Vogel *et al.* 1988). In passing the dam, juveniles are subject to conditions which greatly disorient them, making them highly susceptible to predation by fish or birds. Sacramento pikeminnow (*Ptychocheilus grandis*) and striped bass congregate below the dam and prey on juvenile salmon.

FWS found that more predatory fish were found at rock revetment bank protection sites between Chico Landing and Red Bluff than at sites with naturally eroding banks (Michny and Hampton 1984). From October 1976 to November 1993, CDFG conducted ten mark/recapture experiments at the SWP's Clifton Court Forebay to estimate pre-screen losses using hatchery-reared juvenile Chinook salmon. Pre-screen losses ranged from 69 percent to 99 percent. Predation from striped bass is thought to be the primary cause of the loss (Gingras 1997).

Other locations in the Central Valley where predation is of concern include flood bypasses, release sites for salmonids salvaged at the State and Federal fish facilities, and the Suisun Marsh Salinity Control Structure (SMSCS). Predation on salmon by striped bass and pikeminnow at salvage release sites in the Delta and lower Sacramento River has been documented (Orsi 1967, Pickard *et al.* 1982). Predation rates at these sites are difficult to determine. CDFG conducted predation studies from 1987-1993 at the SMSCS to determine if the structure attracts and concentrates predators. The dominant predator species at the structure was striped bass, and juvenile Chinook salmon were identified in their stomach contents (NMFS 1997).

7. Ecosystem Restoration

a. *CALFED*

Two programs under CALFED, the Ecosystem Restoration Program (ERP) and the Environmental Water Account (EWA), were created to improve conditions for fish, including listed salmonids, in the Central Valley. Restoration actions implemented by the ERP include the installation of fish screens, modification of barriers to improve fish passage, habitat acquisition, and instream habitat restoration. The majority of these recent actions address key factors

affecting listed salmonids, and emphasis has been placed in tributary drainages with high potential for CV steelhead and CV spring-run Chinook salmon production. Additional ongoing actions include new efforts to enhance fisheries monitoring and directly support salmonid production through hatchery releases. Recent habitat restoration initiatives sponsored and funded primarily by the CALFED-ERP Program have resulted in plans to restore ecological function to 9,543 acres of shallow-water tidal and marsh habitats within the Delta. Restoration of these areas primarily involves flooding lands previously used for agriculture, thereby creating additional rearing habitat for juvenile salmonids. Similar habitat restoration is imminent adjacent to Suisun Marsh (*i.e.*, at the confluence of Montezuma Slough and the Sacramento River) as part of the Montezuma Wetlands project, which is intended to provide for commercial disposal of material dredged from San Francisco Bay in conjunction with tidal wetland restoration.

A sub-program of the ERP called the Environmental Water Program (EWP) has been established to support ERP projects through enhancement of instream flows that are biologically and ecologically significant. This program is in the development stage and the benefits to listed salmonids are not yet clear. Clear Creek is one of five watersheds in the Central Valley that has been targeted for action during Phase I of this program.

The EWA is geared to providing water at critical times to meet ESA requirements and incidental take limits without water supply impacts to other users. In early 2001, EWA released 290,000 acre-feet of water at key times to offset reductions in south Delta pumping to protect winter-run Chinook salmon, delta smelt (*Hypomesus transpacificus*), and splittail *(Pogonichthys macrolepidotus*). The actual number of fish saved was very small. The anticipated benefits to fisheries from EWA were much higher than what has actually occurred.

b. *Central Valley Project Improvement Act*

The Central Valley Project Improvement Act implemented in 1992 requires that fish and wildlife get equal consideration with water allocations from the Central Valley Project. From this act arose two programs that have benefited listed salmonids: the Anadromous Fish Restoration Program (AFRP) and the Water Acquisition Program (WAP). The AFRP has engaged in monitoring, education, and restoration projects geared toward recovery of all anadromous fish species residing in the Central Valley. Restoration projects funded through the AFRP include fish passage, fish screening, riparian easement and land acquisition, development of watershed planning groups, instream and riparian habitat improvement, and gravel replenishment. The goal of the WAP is to acquire water supplies to meet the habitat restoration and enhancement goals of the CVPIA and to improve the Department of the Interior's ability to meet regulatory water quality requirements. Water has been used successfully to improve fish habitat for CV spring-run Chinook salmon and CV steelhead by maintaining or increasing instream flows in Butte and Mill Creeks and the San Joaquin River at critical times.

c. *Iron Mountain Mine Remediation*

The Environmental Protection Agency's (EPA) Iron Mountain Mine remediation involves the removal of toxic metals in acidic mine drainage from the Spring Creek Watershed with a state-

of-the-art lime neutralization plant. Contaminant loading into the Sacramento River from Iron Mountain Mine has shown measurable reductions since the early 1990s. Decreasing the heavy metal contaminants that enter the Sacramento River should increase the survival of salmonid eggs and juveniles. However, during periods of heavy rainfall upstream of the Iron Mountain Mine, Reclamation substantially increases Sacramento River flows in order to dilute heavy metal contaminants being spilled from Spring Creek debris dam. This rapid change in flows can cause juvenile salmonids to become stranded or isolated in side channels below Keswick Dam.

d. *SWP Delta Pumping Plant Fish Protection Agreement (Four-Pumps Agreement)*

The Four Pumps Agreement Program has approved about $49 million for projects that benefit salmon and steelhead production in the Sacramento-San Joaquin basins and Delta since the agreement inception in 1986. Four Pumps projects that benefit CV spring-run Chinook salmon and CV steelhead include water exchange programs on Mill and Deer Creeks, enhanced law enforcement efforts from San Francisco Bay upstream to the Sacramento and San Joaquin Rivers and their tributaries, design and construction of fish screens and ladders on Butte Creek, and screening of diversions in Suisun Marsh and San Joaquin tributaries. Predator habitat isolation and removal, and spawning habitat enhancement projects on the San Joaquin tributaries benefit CV steelhead.

The Spring-run Salmon Increased Protection project provides overtime wages for CDFG wardens to focus on reducing illegal take and illegal water diversions on upper Sacramento River tributaries and adult holding areas, where the fish are vulnerable to poaching. This project covers Mill, Deer, Antelope, Butte, Big Chico, Cottonwood, and Battle Creeks, and has been in effect since 1996. Through the Delta-Bay Enhanced Enforcement Program (DBEEP), initiated in 1994, a team of ten wardens focus their enforcement efforts on salmon, steelhead, and other species of concern from the San Francisco Bay Estuary upstream into the Sacramento and San Joaquin River basins. These two enhanced enforcement programs, in combination with additional concern and attention from local landowners and watershed groups on the Sacramento River tributaries which support CV spring-run Chinook salmon summer holding habitat, have been shown to reduce the amount of poaching in these upstream areas.

The provisions of funds to cover over-budget costs for the Durham Mutual/Parrot Phelan Screen and Ladders project expedited completion of the construction phase of this project which was completed during 1996. The project continues to benefit salmon and steelhead by facilitating upstream passage of adult spawners and downstream passage of juveniles.

The Mill and Deer Creek Water Exchange projects are designed to provide new wells that enable diverters to bank groundwater in place of stream flow, thus leaving water in the stream during critical migration periods. On Mill Creek several agreements between Los Molinos Mutual Water Company (LMMWC), Orange Cove Irrigation District (OCID), CDFG, and DWR allows DWR to pump groundwater from two wells into the LMMWC canals to pay back LMMWC water rights for surface water released downstream for fish. Although the Mill Creek Water Exchange project was initiated in 1990 and the agreement for a well capacity of 25 cfs, only 12 cfs has been developed to date (Reclamation and OCID 1999). In addition, it has been determined that a base flow of greater than 25 cfs is needed during the April through June period

for upstream passage of adult CV spring-run Chinook salmon in Mill Creek (Reclamation and OCID 1999). In some years, water diversions from the creek are curtailed by amounts sufficient to provide for passage of upstream migrating adult CV spring-run Chinook salmon and downstream migrating juvenile CV steelhead and CV spring-run Chinook salmon. However, the current arrangement does not ensure adequate flow conditions will be maintained in all years. DWR, CDFG, and FWS have developed the Mill Creek Adaptive Management Enhancement Plan to address the instream flow issues. A pilot project using one of the ten pumps originally proposed for Deer Creek was tested in summer 2003. Future testing is planned with implementation to follow.

IV. ENVIRONMENTAL BASELINE

The environmental baseline is an analysis of the effects of past and ongoing human and natural factors leading to the status of the species within the action area. The environmental baseline "includes the past and present impacts of all Federal, State, or private actions and other human activities in the action area (*i.e.*, lower Feather River), the anticipated impacts of all proposed Federal projects in the action area that have already undergone formal or early section 7 consultation, and the impact of State or private actions which are contemporaneous with the consultation in process" (50 CFR §402.02).

A. Status of the Species and Habitat in the Action Area

1. Status of the Species within the Action Area

The action area contains populations of CV spring-run Chinook salmon and CV steelhead from the Feather River. The action area is a migratory corridor for adult CV spring-run Chinook salmon and CV steelhead, and provides migration and rearing habitat for juveniles of these species. Juvenile Sacramento River winter-run Chinook salmon may migrate upstream into the Feather River during some months. Following is a status summary of these species and their habitat within the action area.

a. *Sacramento River Winter-run Chinook Salmon*

There are no records of winter-run Chinook salmon in the Feather River. Moore (1997) and Maslin *et al.* (1996, 1997) found that juvenile winter-run Chinook salmon rear in non-natal tributaries to the Sacramento River during winter and early spring months. Due to the proximity of the action area to the Sacramento River, it is possible that adult strays, or non-natal juveniles may occur between December and February in some years.

b. *Central Valley Spring-run Chinook Salmon*

The action area contains Feather River populations of CV spring-run Chinook salmon. Adults and juveniles migrate through the action area. Adults hold and spawn approximately 45 miles upstream, in the uppermost three miles of accessible habitat below the Feather River Fish Hatchery (DWR 2001). The number of naturally-spawning spring-run Chinook salmon in the

Feather River has been estimated only periodically since the 1960s, with estimates ranging from 2 fish in 1978 to 2,908 in 1964. Adult spring-run Chinook salmon that return to the Feather River Fish Hatchery have been counted each year since 1963, and their numbers have ranged from 146 in 1967 to 8,662 in 2003 (CDFG 2004).

Based on run-time observations of spring-run Chinook salmon in the Feather River, adults are likely to be present in the action area during the upstream migration period between February and July where they hold in deep coldwater pools until spawning begins in mid- to late August. Results from Feather River Chinook salmon emigration studies indicate virtually all spring-run Chinook salmon juveniles in the Feather River exit as sub-yearlings (DWR 1999a, b ,c). Emigration of young-of-year salmon begins immediately following emergence in late November, peaks in January or February, and continues through June (DWR 1999a, b, c). Rearing and migrating juveniles are likely to be present in the action area from January through June, with the greatest abundance of individuals in January and February.

c. *Central Valley Steelhead*

Limited information exists regarding the abundance, location, and timing of steelhead spawning within the Feather River. The only available information on natural steelhead production in the action area comes from DWR redd surveys on the Feather River (DWR 2003). Based on these surveys, DWR estimated that a minimum of 163 steelhead spawned in the Feather River in 2003. Nearly half (*i.e.*, 48 percent) of all redds were located in the uppermost mile of existing anadromous habitat below the Feather River Fish Barrier Dam. The Feather River Fish Hatchery maintains records of the number of steelhead that have entered the hatchery annually since 1967. Feather River Fish Hatchery counts since 1969 ranged from a low of 78 in 1972 to a high of 2,587 in 1989, with an average of 904 adults per year (DWR 2001).

Steelhead adults migrate upstream in the Sacramento River during the period between December and March to spawn and are likely to enter into the Feather River during the same period. Observations to date suggest that the low-flow channel is the primary reach for steelhead spawning, with up to 75 percent of the spawning occurring in the side channel adjacent to the Feather River Fish Hatchery (DWR 2003).

Chinook salmon emigration studies in the Feather River from 1995 through 1998 have incidentally captured steelhead young-of-year and yearlings. Young-of-year were captured from March through June, while yearlings were captured January through June. Steelhead were not captured during the early migration period, from October and December, but DWR researchers speculated that this may have occurred because the sampling gear may not be able to detect their presence during this time (DWR 1999a, b, c). Based on these results and steelhead emigration patterns in the Sacramento River, steelhead juveniles and smolts are expected to use the action area from December through June, with peak use from January through March.

2. Status of Habitat within the Action Area

The action area (*i.e.*, lower Feather River) provides migration and rearing habitat for Sacramento River winter-run Chinook salmon, CV spring-run Chinook salmon, and CV steelhead. The action area is proposed critical habitat for CV spring-run Chinook salmon and CV steelhead. Habitat requirements for these species are similar. The essential features of freshwater salmonid habitat within the action include adequate substrate, water quality, water quantity, water temperature, water velocity, cover/shelter, food, riparian vegetation, space, and safe passage conditions.

Water temperatures in the action area generally are most favorable for anadromous fish during the winter and spring months and may be warmer than desired conditions from late spring through early fall. High temperatures primarily are caused by ambient air temperatures, but also are affected by the lack of riparian shading, and by thermal inputs from agricultural outfall water.

Habitat within the action area primarily is used as juvenile rearing habitat and as a migration corridor by adults and juveniles. The condition and function of this habitat has been severely impaired through several factors discussed in the *Status of the Species and Habitat* section of this biological and conference opinion. The result has been the reduction in quantity and quality of several essential elements of rearing habitat required by juveniles to grow, and survive. In spite of the degraded condition of this habitat, the conservation value of the action area is high because it is used by a large number of naturally-produced anadromous fish from the Feather River.

B. Factors Affecting the Species and Habitat in the Action Area

The magnitude and duration of peak flows in the Feather River during the winter and spring are reduced by water impoundment in upstream reservoirs. Instream flows during the summer and early fall months have increased over historic levels for deliveries of municipal and agricultural water supplies. Overall, water management now reduces natural variability by creating more uniform flows year-round. Current flood control practices require peak flood discharges to be held back and released over a period of weeks. Consequently, flow in the Feather River often remains too low during the winter to provide quality rearing habitat.

High water temperatures limit habitat availability for listed salmonids in the lower Feather River (Boles *et al.* 1988). High summer water temperatures in the lower Feather River and Sutter Bypass can exceed 72°F. Such temperatures can create a thermal barrier to the migration of adult and juvenile salmonids (Rich 1997, Kjelson *et al.* 1982). Water diversions, for agricultural and municipal purposes are found throughout the action area and entrain and kill juvenile and salmon and steelhead during emigration periods during fall, winter, and spring months.

C. Importance of the action area to species survival and recovery

The action area of the FWD Long-term CVP Water Contract Renewal is located within a reach of the Feather River that is utilized as migration and rearing habitat by all listed anadromous fish populations within the Feather River Basin. Because of the location of the action area near the

confluence with the Sacramento River, out-of-basin juvenile Sacramento River winter-run Chinook salmon, CV spring-run Chinook salmon, and CV steelhead also may use habitats within the action area for non-natal rearing and growth. The use of the action area by such a large number of anadromous fish makes it an important node of habitat for the survival and recovery of Sacramento River winter-run Chinook salmon, CV spring-run Chinook salmon, and CV steelhead, and it is likely that these fish will continue to utilize the action area as a migratory corridor and for rearing.

V. EFFECTS OF THE ACTION

This section discusses the direct and indirect effects of the FWD Long-term CVP Water Contract Renewal on Sacramento River winter-run Chinook salmon, Central Valley spring-run Chinook salmon, and Central Valley steelhead that are expected to result from the proposed action. Cumulative effects (*i.e.,* effects of future State, local, or private actions on endangered and threatened species or critical habitat) are discussed separately.

A. Approach to the Assessment

Pursuant to section 7(a)(2) of the ESA (16 U.S.C. §1536), Federal agencies are directed to ensure that their activities are not likely to jeopardize the continued existence of any listed species or result in the destruction or adverse modification of critical habitat. This biological and conference opinion assesses the effects of the implementation of the FWD Long-term CVP Water Service Contract on endangered Sacramento River winter-run Chinook salmon, threatened CV spring-run Chinook salmon, threatened CV steelhead, and the proposed critical habitat of CV spring-run Chinook salmon and CV steelhead.

In the *Description of the Proposed Action* section of this biological and conference opinion, NMFS provided an overview of the action. In the *Status of the Species* and *Environmental Baseline* sections of this biological and conference opinion, NMFS provided an overview of the threatened and endangered species and critical habitat that are likely to be adversely affected by the activity under consultation.

Regulations that implement section 7(b)(2) of the ESA require biological opinions to evaluate the direct and indirect effects of Federal actions and actions that are interrelated with or interdependent to the Federal action to determine if it would be reasonable to expect them to appreciably reduce listed species' likelihood of surviving and recovering in the wild by reducing their reproduction, numbers, or distribution (16 U.S.C. §1536; 50 CFR 402.02). Section 7 of the ESA and its implementing regulations also require biological opinions to determine if Federal actions would destroy or adversely modify the conservation value of critical habitat (16 U.S.C. §1536).

NMFS generally approaches "jeopardy" analyses in a series of steps. First, we evaluate the available evidence to identify the direct and indirect physical, chemical, and biotic effects of proposed actions on individual members of listed species or aspects of the species' environment (these effects include direct, physical harm or injury to individual members of a species;

modifications to something in the species' environment - such as reducing a species' prey base, enhancing populations of predators, altering its spawning substrate, altering its ambient temperature regimes; or adding something novel to a species' environment - such as introducing exotic competitors or a sound). Once we have identified the effects of an action, we evaluate the available evidence to identify a species' probable response (including behavioral responses) to those effects to determine if those effects could reasonably be expected to reduce a species' reproduction, numbers, or distribution (for example, by changing birth, death, immigration, or emigration rates; increasing the age at which individuals reach sexual maturity; decreasing the age at which individuals stop reproducing; among others). We then use the evidence available to determine if these reductions, if there are any, could reasonably be expected to appreciably reduce a species' likelihood of surviving and recovering in the wild.

To evaluate the effects of the FWD Long-term CVP Water Contract Renewal, NMFS examined the diversion periods specified in the contract with the seasonal periods that anadromous salmonids are expected to be present within the action area. If an overlap was detected between water conveyance, water withdrawals, and water use, we examined the degree of overlap to identify likely impacts to listed anadromous salmonids within the action area based on the best available information.

The primary information used in this assessment includes fishery information previously described in the *Status of the Species* and *Environmental Baseline* sections of this biological and conference opinion; studies and accounts of the impacts of water diversions on anadromous species; and documents prepared in support of the proposed action, including the April 2004 BA and the Revised Draft EA.

B. Assessment

The assessment will consider the nature, duration, and extent of the proposed action relative to the migration timing, behavior, and habitat requirements of federally-listed anadromous fish that are expected to be within the action area during the diversion period. This assessment will consider water delivery and water use impacts CV spring-run Chinook salmon and CV steelhead and their proposed critical habitat. Sacramento River winter-run Chinook salmon will not be within the action area during the irrigation season and are not expected to be adversely affected by the action.

The proposed action could affect CV spring-run Chinook salmon and CV steelhead when water is being diverted at FWD pump stations for irrigation. Water delivery and water use may affect salmonids through changes in the flow of the Feather River, by diverting fish into diversion channels, and by entraining fish at diversion points. Agricultural runoff is captured by the FWD and re-used. Runoff may percolate into Gilseizer Slough, but does not re-enter anadromous habitat as surface flow. Because return flows percolate into agricultural soils and do not reach anadromous habitat as surface flows, potential impacts are not measurable, and are considered discountable and unlikely to occur.

a. *Flow Changes*

Water delivery and diversion could decrease water levels in the lower 17 mile reach of the Feather River between the northern pump station channel inlet and the confluence with the Sacramento River (*i.e.*, between RM 17 and RM 0), which may impede the successful migration of juvenile and adult salmonids. The FWD's typical diversion rate is 45 cfs at the northern pump, near RM 17, and 27 cfs at the southern pump, near RM 12. During the diversion period, Feather River flows typically range from 5,000 to 10,000 cfs. The combined diversion rate (*i.e.*, 72 cfs) is low relative to typical river flow. Areas on the lower Feather River that have been identified as potential fish passage impediments during low flows are Shanghai Bend, the Sunrise Pump Diversion, and Steep Riffle. All of these sites are located upstream of the action area, and will not be affected by the action. Other than the presence of numerous unscreened diversion points, NMFS is not aware of any additional fish passage concerns in the action area. Therefore, NMFS does not suspect that a continued flow reduction of 72 cfs will adversely affect the upstream migration of adult salmon and steelhead, or the downstream migration of juveniles. Water delivery impacts to Sacramento River flows will be avoided with additional flow to the Sacramento River provided through releases from Shasta Reservoir. Therefore, Sacramento River flows will not be reduced as a result of the action.

b. *Entrainment*

Juvenile CV spring-run Chinook salmon and CV steelhead are at risk of being diverted into diversion channels and entrained into diversion pumps because migration periods partially overlap with the irrigation season. CV spring-run Chinook salmon and CV steelhead from the Feather River are the most likely populations to enter project canals because both of these populations must migrate through the action area.

During typical pumping operations, the water velocity in the diversion channels is estimated to be approximately 0.3 fps (BOR 2004a). At the pump intake, velocities are likely to be higher because flow is moved into a narrower cross-sectional area to enter the diversion intake pipes. Because the volume of water moving into the pumps is a constant, as the cross sectional area decreases, the velocity increases. Velocities below 0.33 fps can be negotiated and avoided by very small Chinook salmon and steelhead fry (Nordlund 1986, NMFS 1997b, CDFG 2000). Because diversion channel velocities are low enough to be negotiated by small fish, it is unlikely that salmon and steelhead will be involuntarily diverted from the course of their normal migration. However, fish may voluntarily enter diversion channels for temporary rearing, or to avoid high flows in the Feather River. Juveniles that enter the diversion channels and swim in front of water pump intakes while they are in operation are likely to be entrained because velocities at the pump intakes are expected to exceed 0.33 fps. Entrained fish are not expected to survive because they will be mutilated by pumps or deposited into irrigation fields that lack suitable rearing and migration components such as flow and connectivity to normal rearing corridors.

Adult Chinook salmon and steelhead are strong swimmers capable of sustained swimming speeds up to 4.6 fps, and burst speeds up to 26 fps (Powers and Orsborn 1984). Because of their

large size and superior swimming abilities adult salmon and steelhead may enter project canals but are not expected to be entrained into pump intakes.

Entrainment risk is influenced by the relative abundance of migrating juveniles during the irrigation diversion season, when pumps are in operation. Juvenile Chinook salmon in the Feather River emigrate from late November through early June, with a peak from January through March. Steelhead juveniles are expected to emigrate from the Feather River from December through June, with a peak in March and April. The irrigation season extends from May through October, with the greatest water diversion from June through September. Thus, there is a potential for juvenile fish to be entrained during May and June.

May and June are at the end of the emigration season and juvenile Chinook salmon and steelhead abundance in the action area is probably low. A review of juvenile Chinook salmon emigration patterns in the lower Feather River (DWR 2002) supports this assumption. From 1998 to 2000, 0.4 percent of Feather River Chinook salmon emigrated in May, and 0.004 percent emigrated in June (DWR 2002). The relative abundance of juvenile steelhead during the irrigation period is more difficult to discern because steelhead are less abundant, larger, and better swimmers, making them more difficult to capture and monitor than Chinook salmon. A review of steelhead emigration data (DWR 1999a, b) indicates that steelhead abundance in May and June also is low. Steelhead captures in May and June of the 1997 through 1998 trapping season, represent 16 percent and 1 percent, respectively, of the overall capture. The rate was slightly different in 1996 (*i.e.,* 11 percent and 9 percent, respectively), but sampling did not begin until March and it is likely that much of the run was not represented. Based on the low proportion of emigrants during the diversion period, we expect that the number of fish that may be entrained also will be low. We also expect that the proportion of entrained will be low relative to the overall abundance of the species. Winter-run Chinook salmon will not be in the action area during the diversion period and are not expected to be adversely affected by diversion activities.

VI. CUMULATIVE EFFECTS

Cumulative effects include the effects of future State, tribal, local, or private actions that are reasonably certain to occur in the action area considered in this biological and conference opinion. Future Federal actions that are unrelated to the proposed action are not considered in this section because they require separate consultation pursuant to section 7 of the ESA.

Ongoing agricultural activities likely will continue to cause entrainment into diversions, and adversely affect water quality. Levee maintenance and bank stabilization will continue to fragment habitat availability. These actions and conditions may injure or kill salmonids by affecting food availability, growth rate, susceptibility to disease, or other physiological processes necessary for survival.

VII. INTEGRATION AND SYNTHESIS

A. Impacts of the Proposed Action on Sacramento River Winter-run Chinook Salmon, Central Valley Spring-run Chinook Salmon, and Central Valley Steelhead, and their Habitat

NMFS finds that the proposed action will affect juvenile CV spring-run Chinook salmon and CV steelhead by causing death of individuals through entrainment at the northern and southern diversion pumps for the next 25 years.

Juvenile entrainment is most likely in May and June when the end of the juvenile emigration period coincides with the beginning of the irrigation season. Entrainment rates relative to overall population abundance are expected to be small because the irrigation season avoids peak migration periods, and because diversion rates during the beginning of the irrigation season typically are low.

B. Impacts of the Proposed Action on ESU Survival and Recovery

The adverse effects to CV spring-run Chinook salmon and CV steelhead within the action area are not expected to affect the overall survival and recovery of the ESUs. This is largely due to the fact that diversion and irrigation activities do not coincide with peak migration periods. Some juvenile CV spring-run Chinook salmon and CV steelhead will be migrating through the action area during the beginning and the end of the water use period and some will be entrained and killed each year for the next 25 years. However, the action is only expected to affect a small number of juveniles each year, and the relative number of entrained juveniles will be small compared to the overall juvenile population size. Therefore, adverse population-level impacts that may affect survival and recovery are not anticipated. Sacramento River winter-run Chinook salmon will not be within the action area during the irrigation season and are not expected to be adversely affected by the action.

C. Impacts of the Proposed Action on Proposed Critical Habitat

Habitat changes related to water deliveries and diversions are not expected to modify the migration, rearing, holding, or spawning success of CV spring-run Chinook salmon and CV steelhead. Most measurable changes to flow will occur during summer months when federally-listed anadromous fish are not present. Therefore, the proposed action is not expected to adversely modify the conservation value of proposed critical habitat.

VIII. CONCLUSION

After reviewing the best available scientific and commercial information; the current status of Sacramento River winter-run Chinook salmon, CV spring-run Chinook salmon, CV steelhead, and the designated critical habitat of Sacramento River winter-run Chinook salmon; the environmental baseline for the action area; the effects of the proposed action; and the cumulative effects, it is NMFS' biological opinion that the FWD Long-term CVP Water Contract Renewal,

as proposed, is not likely to jeopardize the continued existence of Sacramento River winter-run Chinook salmon, CV spring-run Chinook salmon, or CV steelhead, and is not likely to destroy or adversely modify the designated critical habitat Sacramento River winter-run Chinook salmon.

After reviewing the best available scientific and commercial information, the current status of proposed CV spring-run Chinook salmon and CV steelhead critical habitat, the environmental baseline for the action area, the effects of the proposed action, and the cumulative effects, it is NMFS' conference opinion that the FWD Long-term CVP Water Contract Renewal, as proposed, is not likely to destroy or adversely modify the proposed critical habitat CV spring-run Chinook salmon and CV steelhead.

IX. INCIDENTAL TAKE STATEMENT

Section 9 of the Act and Federal regulation pursuant to section 4(d) of the Act prohibit the take of endangered and threatened species, respectively, without special exemption. Take is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or to attempt to engage in any such conduct. Harm is further defined by NMFS as an act which kills or injures fish or wildlife. Such an act may include significant habitat modification or degradation where it actually kills or injures fish or wildlife by significantly impairing essential behavioral patterns, including breeding, spawning, rearing, migrating, feeding or sheltering. Incidental take is defined as take that is incidental to, and not the purpose of, the carrying out of an otherwise lawful activity. Under the terms of section 7(b)(4) and section 7(o)(2), taking that is incidental to and not the purpose of the agency action is not considered to be prohibited taking under the Act provided that such taking is in compliance with the terms and conditions of this Incidental Take Statement.

The measures described below are non-discretionary, and must be undertaken by Reclamation so that they become binding conditions of any grant or permit, as appropriate, for the exemption in section 7(o)(2) to apply. Reclamation has a continuing duty to regulate the activity covered by this incidental take statement. If Reclamation: (1) fails to assume and implement the terms and conditions or (2) fails to require the contractors to adhere to the terms and conditions of the incidental take statement through enforceable terms that are added to the permit or grant document, the protective coverage of section 7(o)(2) may lapse. In order to monitor the impact of incidental take, Reclamation must report the progress of the action and its impact on the species to NMFS as specified in the incidental take statement [50 CFR §402.14(I)(3)].

A. Amount or Extent of Take

NMFS anticipates incidental take of CV spring-run Chinook salmon and CV steelhead from death due to entrainment at the northern and southern diversion pumps, and by causing injury and death from exposure to contaminated agricultural discharge and increased water turbidity and water temperature. Incidental take of Sacramento River winter-run Chinook salmon is not expected.

NMFS cannot, using the best available information, quantify the anticipated incidental take of individual CV spring-run Chinook salmon and CV steelhead because of the variability and uncertainty associated with the population size of each species, annual variations in the timing of migration, and uncertainties regarding individual habitat use of the project area. However, it is possible to describe the conditions that will lead to the take. Although the exact percentage of each ESU that will be affected cannot be determined, because of the size of the project, and the brief exposure time that fish will face, a small percentage of each population (*i.e.*, less than 1 percent) is expected be injured or killed. Accordingly, NMFS is quantifying take of CV spring-run Chinook salmon and CV steelhead incidental to the FWD Long-term CVP Water Contract Renewal in terms associated with the extent and duration of water diversion and water use activities.

NMFS anticipates that, during the contract water use period (*i.e.*, through 2029), take in the form of injury and death to juvenile CV spring-run Chinook salmon and juvenile CV steelhead will occur from entrainment from the use of up to 20 TAF of contract water. Specifically, take is expected from a total of 2.57 TAF during May and June when pumps are operating at a combined diversion rate of up to 72 cfs.

B. Effect of the Take

NMFS has determined that the above level of take is not likely to jeopardize Sacramento River winter-run Chinook salmon, CV spring-run Chinook salmon, or CV steelhead. The effect of this action will consist of fish behavior modification, loss of habitat value, and potential death or injury of juvenile CV spring-run Chinook salmon and CV steelhead. Sacramento River winter-run Chinook salmon will not be within the action area during the irrigation season and are not expected to be adversely affected by the action.

C. Reasonable and Prudent Measures

NMFS has determined that the following reasonable and prudent measure is necessary and appropriate to minimize the incidental take of listed anadromous salmonids.

1. Measures shall be taken to minimize salmonid injury and mortality during the contract period.

D. Terms and Conditions

In order to be exempt from the prohibitions of section 9 of the Act, Reclamation must comply with the following terms and conditions, which implement the reasonable and prudent measures described above and outline required reporting/monitoring requirements. These terms and conditions are non-discretionary.

1. Measures shall be taken to minimize salmonid injury and mortality during the contract period to the maximum extent practicable.

    a. Reclamation shall coordinate with FWD and NMFS, to minimize pumping of CVP replaced water from the Feather River, to the maximum extent

practicable, during the months of May and June to minimize entrainment of juvenile salmonids, until the diversion pumps are screened in accordance with NMFS fish screen criteria.

b. Reclamation shall utilize programs within their authority to screen FWD's northern and southern water pumping facilities with state-of-the-art fish screens that meet NMFS and CDFG fish screen criteria.

c. Reclamation shall provide a project summary and compliance report to NMFS within 12 months of the issuance of this biological and conference opinion. Annual compliance reports shall be submitted until the diversions are screened to NMFS and CDFG fish screen criteria. These reports shall describe implementation of the terms and conditions of the biological and conference opinion.

Reports and notifications required by these terms and conditions shall be submitted to:

Sacramento Area Office Supervisor
National Marine Fisheries Service
650 Capitol Mall, Suite 8-300
Sacramento California 95814-4706
FAX: (916) 930-3629
Phone: (916) 930-3600

X. CONSERVATION RECOMMENDATIONS

Section 7(a)(1) of the ESA directs Federal agencies to utilize their authorities to further the purposes of the ESA by carrying out conservation programs for the benefit of endangered and threatened species. These conservation recommendations include discretionary measures that Reclamation can implement to avoid or minimize adverse effects of a proposed action on a listed species or critical habitat or regarding the development of information. NMFS provides the following conservation recommendations that would avoid or reduce adverse impacts to listed salmonids:

1. Reclamation should expand CV spring-run Chinook salmon and CV steelhead monitoring programs throughout the lower Feather River to improve understanding of the life history of these listed species and improve the ability to coordinate water management and fisheries protection.

2. Reclamation should coordinate with FWD, NMFS and CDFG to conduct fish entrainment monitoring at their pumping stations.

3. Reclamation should utilize programs within their authority, to develop and implement water use efficiency projects with FWD and other Central Valley

water contractors to minimize water demand and the amount of water withdrawn from anadromous fish habitat.

4. Reclamation should develop and implement a real-time juvenile salmonid monitoring program in the lower Feather River in cooperation and with assistance from CDWR, CDFG, and NMFS, in order to adaptively manage water deliveries and diversions with the objective of minimizing entrainment of juvenile salmonids at the pump facilities.

To be kept informed of actions minimizing or avoiding adverse effects, or benefiting listed and proposed species or their habitats, NMFS requests notification of the implementation of any conservation recommendations.

XI. REINITIATION OF CONSULTATION

This concludes formal consultation on the proposed FWD Long-term CVP Water Contract Renewal. Reinitiation of formal consultation is required if: (1) the amount or extent of taking specified in any incidental take statement is exceeded, (2) new information reveals effects of the action that may affect listed species or critical habitat in a manner or to an extent not previously considered, (3) the action is subsequently modified in a manner that causes an effect to the listed species that was not considered in the biological and conference opinion, or (4) a new species is listed or critical habitat is designated that may be affected by the action. In instances where the amount or extent of incidental take is exceeded, formal consultation shall be reinitiated immediately.

You may request NMFS to confirm the conference opinion as a biological opinion if the proposed critical habitat designations become final. The request must be in writing. If NMFS reviews the proposed action and finds that there have been no significant changes to the action or in the information used during the conference, NMFS will confirm the conference opinion as the biological opinion on the project, and no further section 7 consultation will be necessary.

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